National Aeronautics and Space Administration

Teaching Note for NASA Case Study GSFC-1011T-1

CALIPSO: Management Challenges within a Complex Project Structure

Synopsis

CALIPSO was proposed as a pioneering tool for three-dimensional modeling of Earth's atmosphere to facilitate understanding of how clouds and airborne particles affect Earth's climate, with implications for pollution control and weather forecasting. The only direct selection in NASA's second Earth System Science Pathfinder mission series, *CALIPSO* (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) was heralded as the vanguard in a new era of earth science discoveries from space—but midway through project development, it was unclear if it would make it out of the review process.

At the heart of the *CALIPSO* case is the question: Who's in charge? The arduous eight-year path the project took from proposal to launch was marked by difficult relationships between Langley Research Center (LaRC) and Goddard Space Flight Center (GSFC), and between NASA and the mission's international partners. *CALIPSO* suffered from a complex project structure: LaRC and the French national space agency were co-principal investigators but the mission manager was located at GSFC, the center-assigned oversight of the mission by NASA HQ. The intricacy of the organizational relationships and a poor project-management relationship between the two centers damaged communications. At the same time, the International Trafficking in Arms Regulation (ITAR) restricted data sharing among the partners, fostering mistrust and further corroding communication channels. In combination, instrument and spacecraft issues conspired to push back the schedule, drive up costs, and jeopardize the mission.

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Purpose

CALIPSO is a model case study of how a project with intrinsic organizational challenges is further complicated by communication issues due to disagreement over responsibilities among project partners. A key objective of the case is to illustrate the importance of:

- Clear definitions of work elements and interfaces on very large projects, such as *CALIPSO*;
- Timing in decision-making, and making small changes early in a project's lifecycle;
- Open lines of communication;
- Agreement on technical decisions, even if (or especially when) communication in other areas is poor;
- Clearly drawn and agreed-upon roles and responsibilities.

Discussion Questions

The case narrative concludes in the spring of 2003, nearly five years after *CALIPSO* initiated and still three years away from launch. The mission has just undergone another major change: The LaRC project manager has retired. The reader is put in the shoes of a decision-maker in preparation for a critical meeting. Are there opportunities hiding in the morass? Is a "replan" needed?

At the conclusion of the case, participants are left considering three issues. For the discussion, three corresponding questions should be posed:

1. **The problems related to authority, roles, and responsibility.** What are some possibilities for resolving the issue of dual responsibility between LaRC and GSFC and getting the right project manager on board? What kind of project manager is needed at this time?
2. **The interfaces between GSFC, *CNES*/*Alcatel*, BATC, and LaRC are interfering with the technical focus. The French partners do not understand the GSFC role and rarely interact with the GSFC team, and the LaRC team feels that the GSFC team is looking at both LaRC and *CNES* as contractors instead of partners.** Are those cultural or management issues, and how can they be addressed?
3. **The suggestion that *CALIPSO* is in need of a completely new direction.** Should the viability of the mission itself be reconsidered? And are there lessons concerning the principal investigator (PI) missions?

As the epilogue relates, *CALIPSO* has conducted pioneering observations of unprecedented resolution and delivered more than 98% of all available science observations with no instrument-related measurement difficulties. The mission celebrated its one-year anniversary in April 2007.

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Learning Format

A facilitated, participant-focused discussion is recommended for this case. After participants discuss the questions among themselves in small groups (or more informally), the Socratic method of asking questions followed by summarizing each person's discussion points (on paper or whiteboard) may be most productive. Follow-up questions are an effective way to facilitate discussion.

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